

[54] PRINTING APPARATUS

[75] Inventors: **Herbert Tramposch**, Riverside, Conn.; **Daniel M. Kabak**, Yonkers, N.Y.

[73] Assignee: **Pitney-Bowes, Inc.**, Stamford, Conn.

[22] Filed: **Mar. 19, 1971**

[21] Appl. No.: **125,934**

[52] U.S. Cl. **101/93, 101/103, 101/333, 197/37**

[51] Int. Cl. **B41j 27/02, B41j 9/20**

[58] Field of Search **101/93 C, 103, 104, 101/105, 108, 95, 202, 327, 333, 334; 197/37, 24**

[56] References Cited

UNITED STATES PATENTS

1,166,667	1/1916	Folger et al.	101/103
1,402,200	1/1922	Winterer	197/37
2,600,156	6/1952	Cerceaw	197/37
3,049,990	8/1962	Brown et al.	101/93 C
3,072,047	1/1963	Mavosley et al.	101/93 C
3,359,921	12/1967	Arnold et al.	101/93 C
3,371,601	3/1968	Lane	101/202 X
3,585,929	6/1971	Gopperton	101/95

Primary Examiner—Robert E. Pulfrey

Assistant Examiner—Eugene H. Eickholt

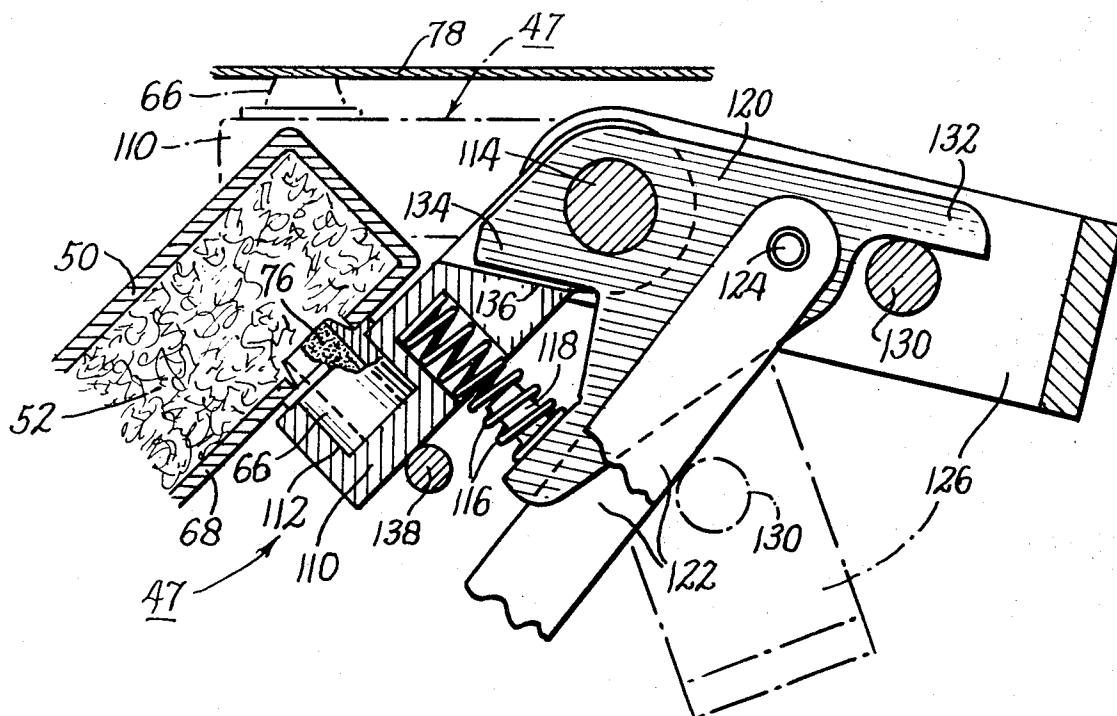
Attorney—William D. Soltow, Jr., Albert W. Scribner, Martin D. Wittstein and Louis A. Tirelli

[57]

ABSTRACT

A plurality of linearly aligned, independently selectable, pivotally mounted printing heads are provided, each having a wettable transfer element for transferring a fluorescent material in solution from a reservoir to a card being printed. A means for selecting and rotating one or more of the printing heads into contact with a record medium comprises a plurality of pivotally supported elongated lever arms one of which is associated with each head, a linking means for coupling each of said lever arms to said heads for causing rotation of said heads upon movement of an associated lever arm, a means coupled to another segment of each of said lever arms for selectively inhibiting motion of said lever arm about a pivot point thereby inhibiting the rotation of the printing head and a biasing means for applying a force to each of the lever arms for forcing selected printing heads into contact with a card being imprinted.

5 Claims, 7 Drawing Figures



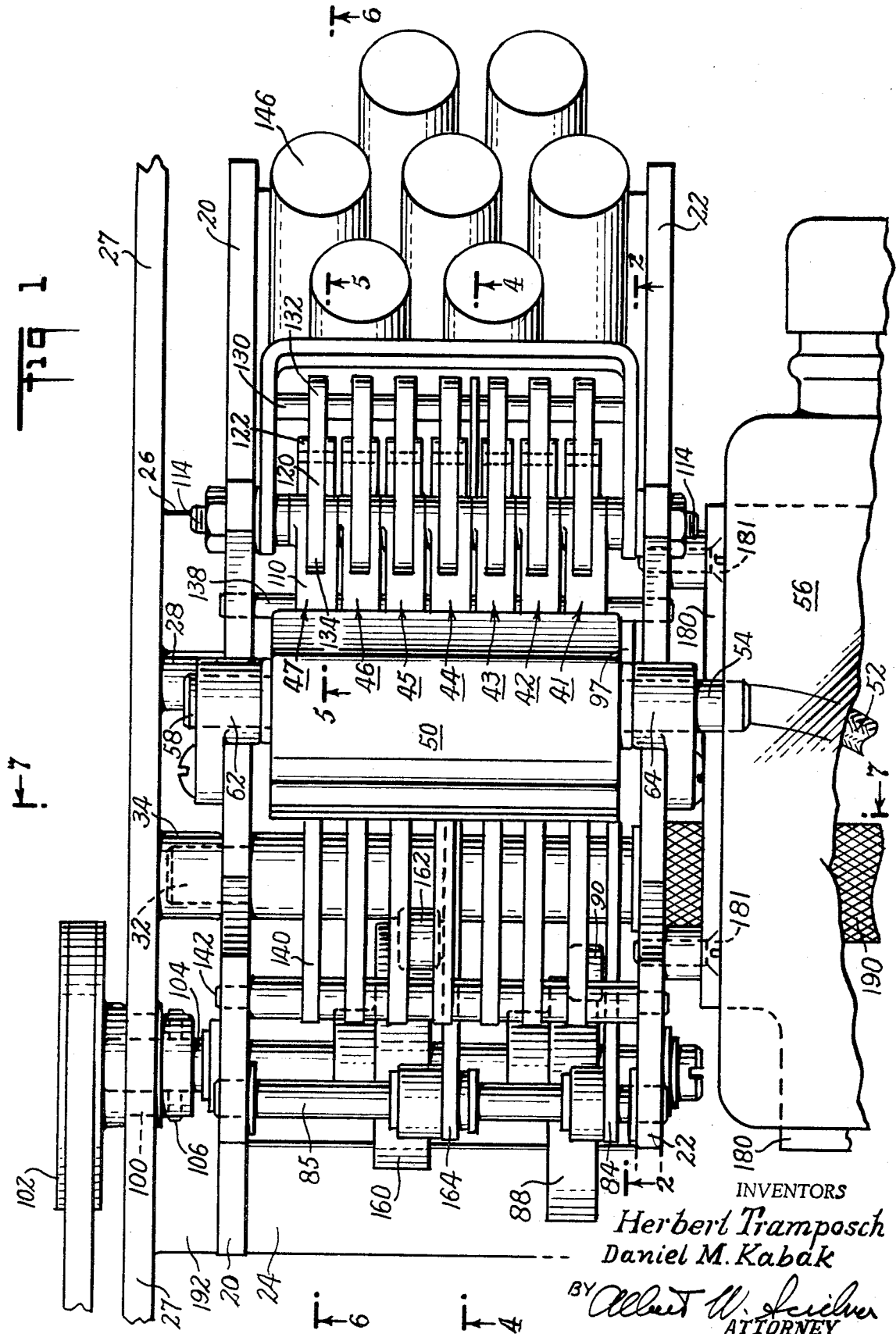


Fig 2

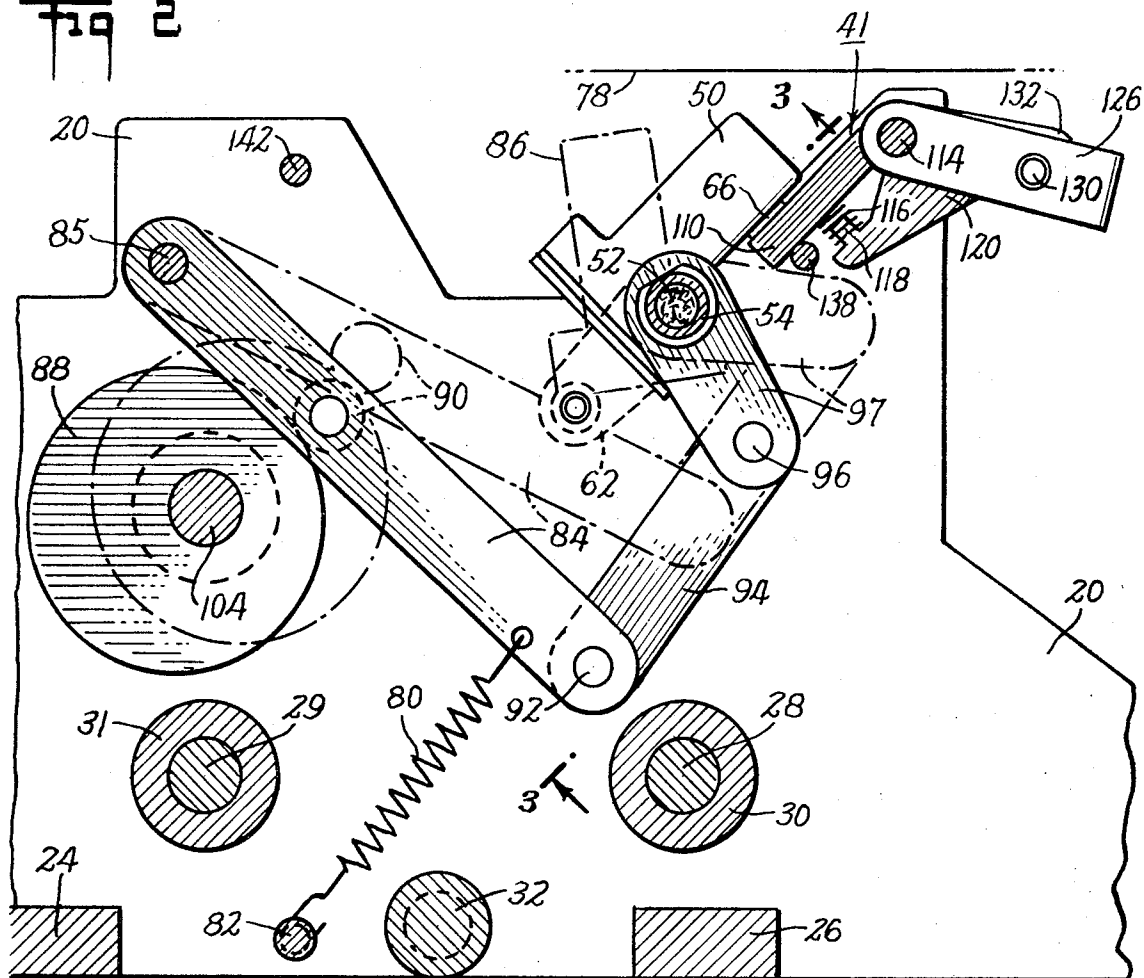


Fig 3

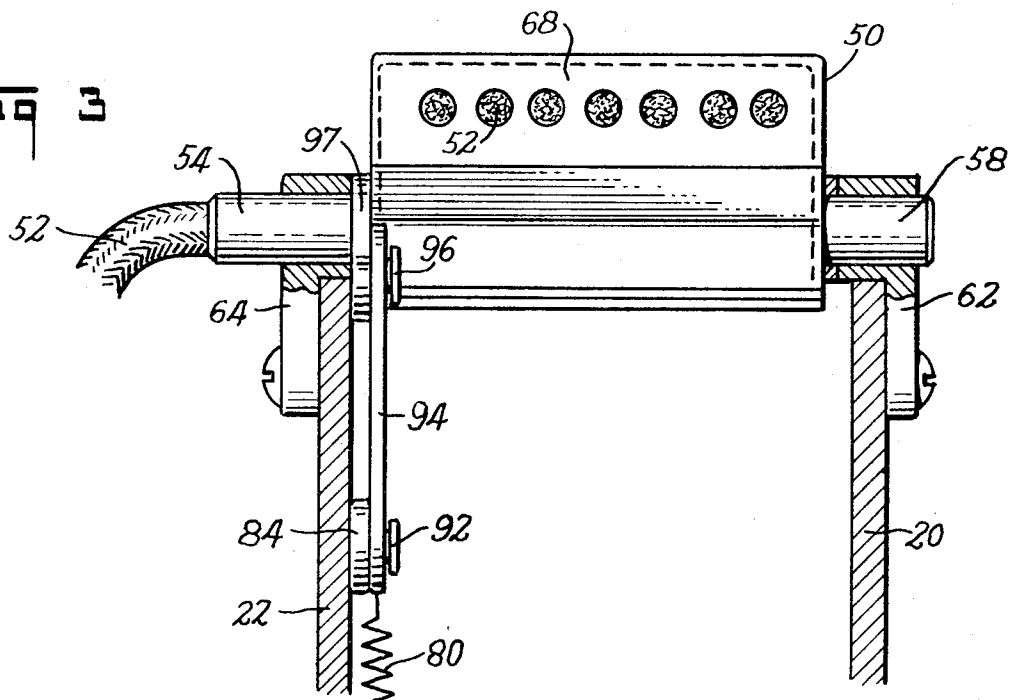


Fig 4

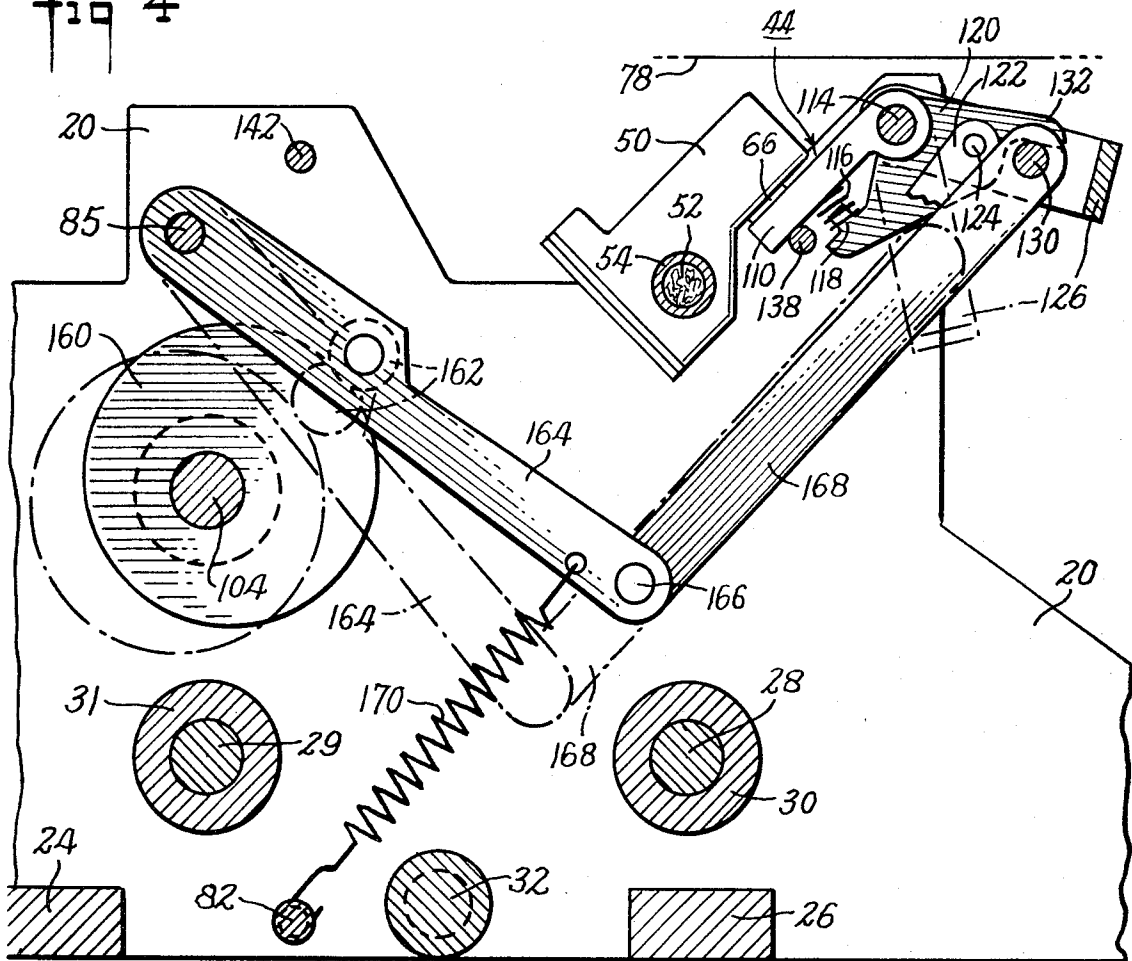
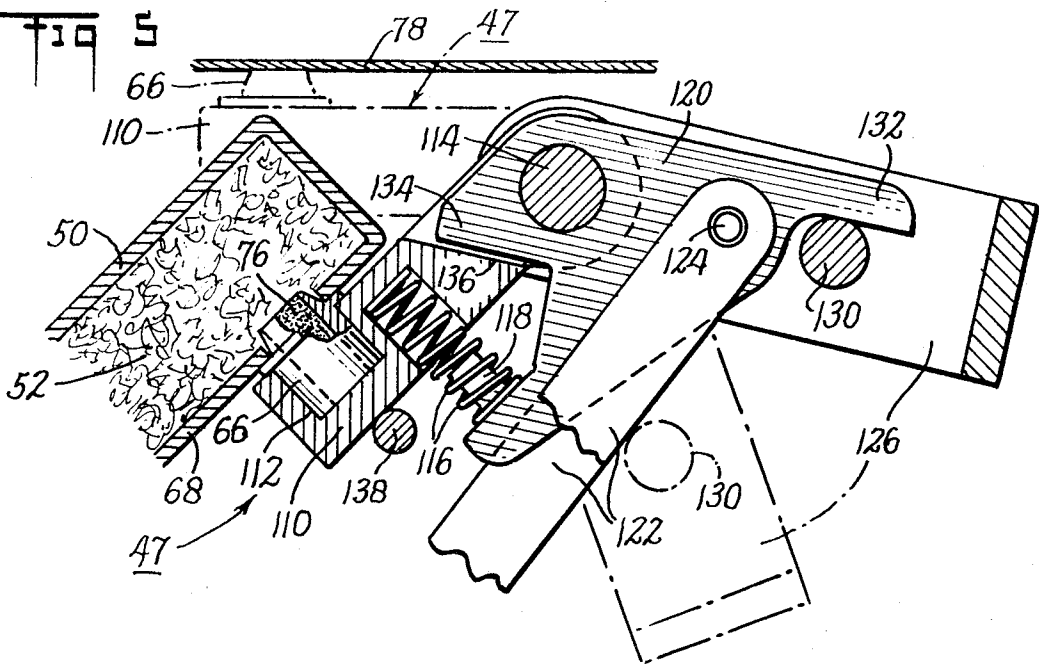
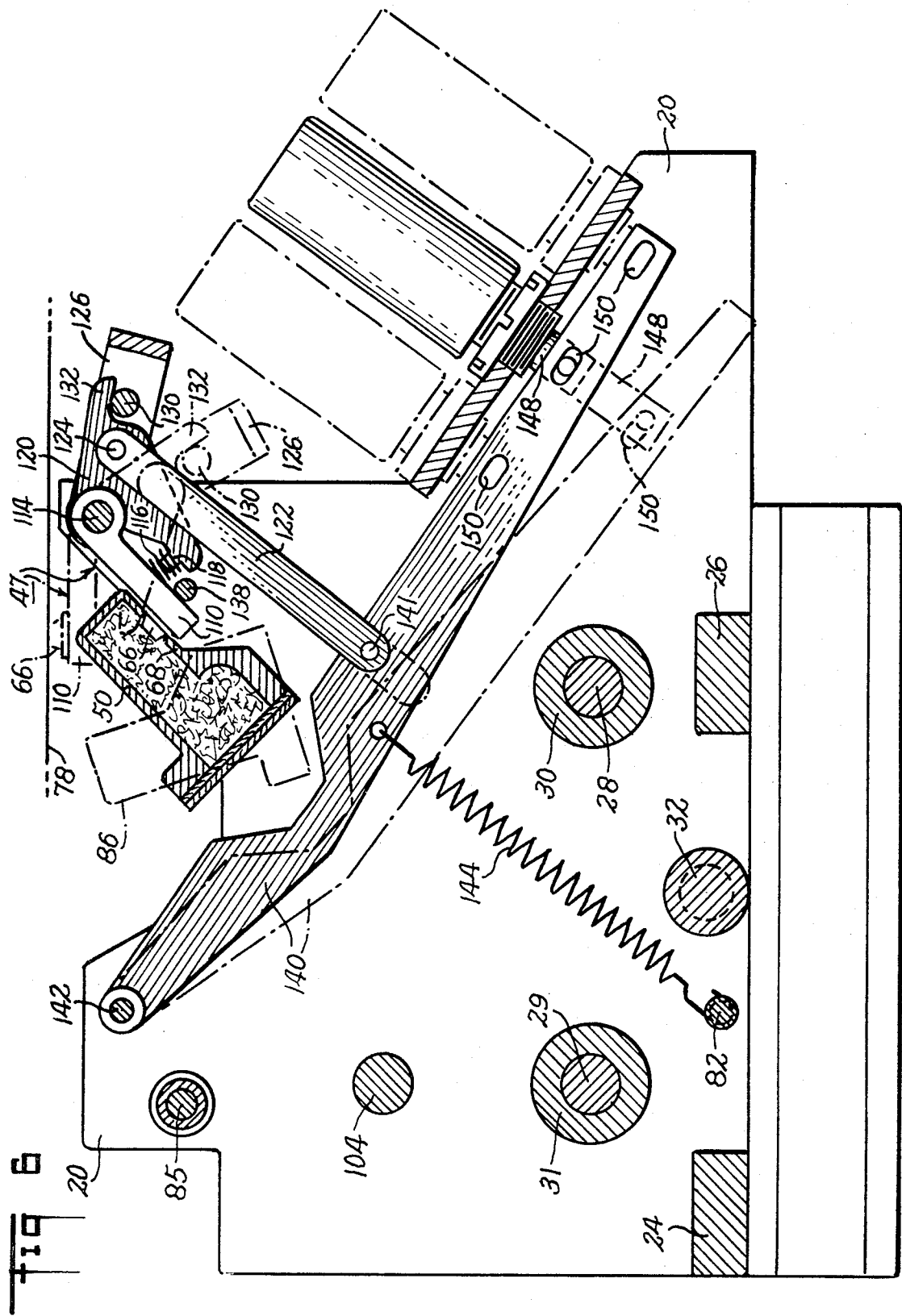
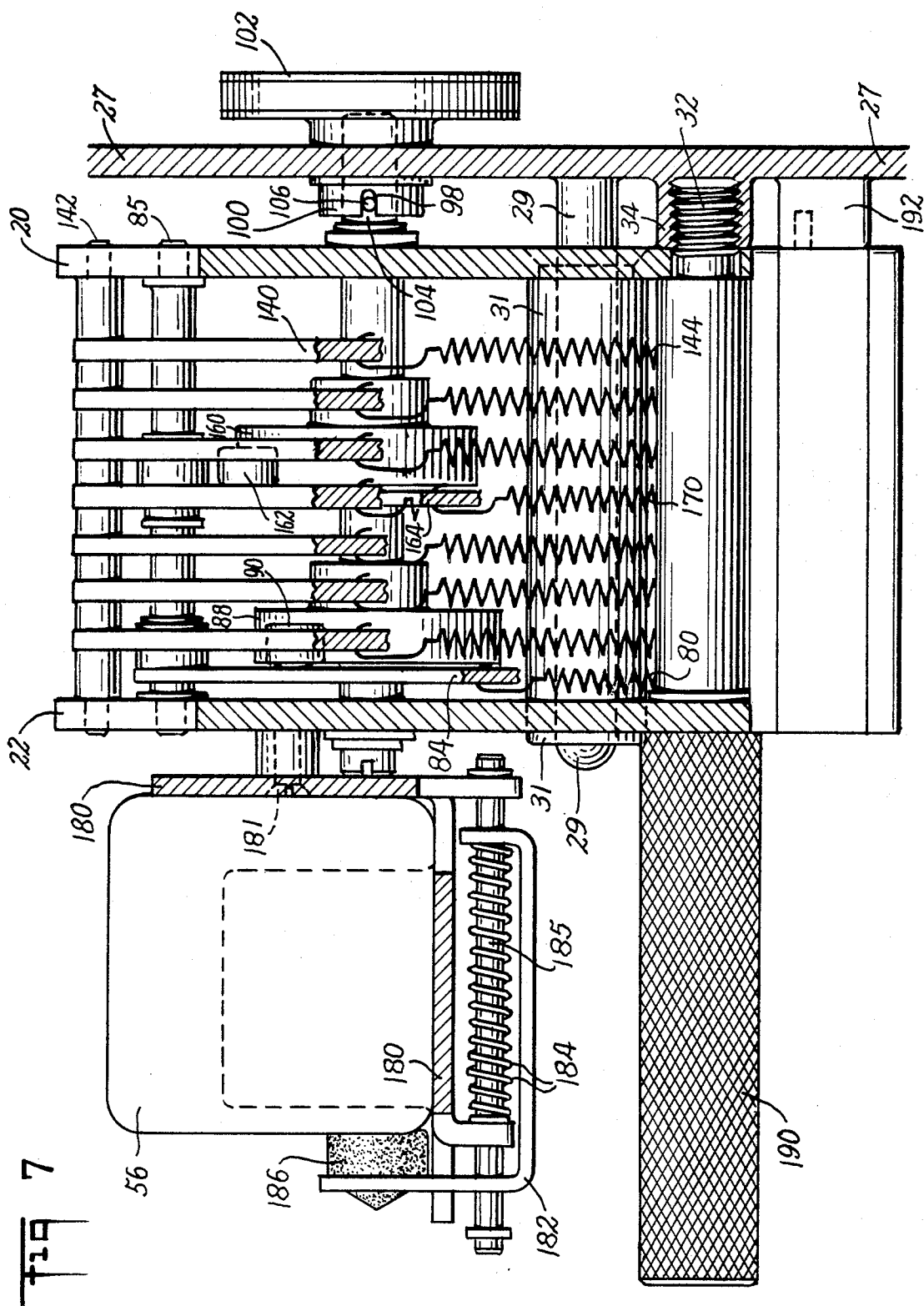


Fig 5







PRINTING APPARATUS

This invention relates to apparatus for establishing identification data on a credit card or the like. The invention relates more particularly to an improved printing apparatus for establishing on the card identification data which is both machine readable and invisible to the naked eye.

Credit card security systems are known wherein an issued credit card includes identification data useful at the point of purchase for verifying the account status of the card holder. The identification data is preferably formed on a card in a manner which renders it ordinarily invisible to the naked eye but is machine readable. In one credit card security system the identification data is formed of a plurality of marks arranged in a digital code on the card. The marks are formed by depositing on the card a fluorescent material in solution with a volatile solvent for the card material. These marks are located at predetermined positions in a rectangular array of rows and columns on the surface of the card. The identification data, although rendered invisible to the naked eye, can be read when exposed under ultraviolet light and the digital nature of the coding facilitates machine reading of the data.

An apparatus for imprinting identification data on the card is preferably relatively noncomplex in construction in order to insure reliability of operation, to prolong the operation of the apparatus, to enhance the serviceability of the apparatus and to reduce its overall cost. A printing apparatus of this type is disclosed and claimed in copending U.S. Pat. application, entitled PRINTING APPARATUS, Ser. No. 117,920 filed on Feb. 26, 1971 and assigned to the assignee of the present invention. It is desirable to further enhance operating reliability of this type of printing apparatus by reducing the number of parts employed in such apparatus and to concurrently reduce the cost of the apparatus.

Accordingly, it is an object of this invention to provide an improved printing apparatus.

Another object of the invention is to provide an improved printing apparatus for printing a plurality of marks in a digital code on a credit card.

Another object of the invention is to provide a printing apparatus of the type described having relatively increased reliability.

A further object of the invention is to reduce the cost of construction of a printing apparatus of the type described.

In accordance with features of the invention, a plurality of linearly aligned, independently selectable, pivotally mounted printing heads are provided, each having a wettable transfer element for transferring a fluorescent material in solution from a reservoir to a card being printed. A means for selecting and rotating one or more of the printing heads into contact with a record medium comprises a plurality of pivotally supported elongated lever arms one of which is associated with each head, a linking means for coupling each of said lever arms to said heads for causing rotation of said heads upon movement of an associated lever arm, a means coupled to another segment of each of said lever arms for selectively inhibiting motion of said lever arm about a pivot point thereby inhibiting the rotation of the printing head and a biasing means for applying a force to each of the lever arms for forcing selected printing heads into contact with a card being imprinted.

These and other objects and features of the invention will become apparent from the following specifications and from the drawings wherein:

FIG. 1 is a plan view of a printing apparatus constructed in accordance with features of this invention:

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1 illustrating a reservoir drive means for the apparatus of FIG. 1:

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 2;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1 illustrating a bail assembly and drive for the printing apparatus of FIG. 1;

FIG. 5 is an enlarged sectional view taken along line 5—5 of FIG. 1 illustrating a printing head assembly;

FIG. 6 is a sectional view taken along line 6—6 of FIG. 1 illustrating a printing head select and drive mechanism; and,

FIG. 7 is a sectional view taken along line 7—7 of FIG. 1 illustrating a printing head linkage and reservoir mounting.

The printing apparatus described herein and illustrated in the drawings comprises an element in a credit card security system of the type described in my copending U.S. Pat. application entitled Credit Card and Method of Luminiscent Printing, Ser. No. 58,486, filed on July 27, 1970, which is assigned to the assignee of this invention, the disclosure of which is incorporated herein by reference. A credit card transport, which for purposes of clarity in the drawings is not illustrated transports a credit card through various stages of a card preparation system to a printing apparatus. The card includes a surface area for receiving a plurality of digitally coded marks at any of a large number of digital locations defined by a rectangular array of columns and rows. In a particular example, the rectangular array comprises seven rows each extending in the direction of a generally longer dimension or length of a typical wallet size credit card and 19 columns each extending in the direction of a generally shorter dimension or width of the card. A card of this general configuration is advanced with a stepping motion in the direction of its length and one or more of seven printing heads which are aligned along a width of the card are driven into contact with the card and imprint data in a single column during one printing cycle.

Referring now to FIG. 1 of the drawings, the printing apparatus is shown to include a rigid support frame formed by parallel aligned plate frame members 20 and 22 and transverse frame members 24 and 26. The frame which supports a printing mechanism described in detail hereinafter is mounted on and aligned with a wall member 27 of the apparatus of the card preparation system through the use of guide pins 28 and 29 (FIG. 2). These guide pins are mounted to the wall member 27 of the apparatus and extended through concentrically positioned tubular guides 30 and 31 which are secured between the frame members 20 and 22 of the printing apparatus. A mounting screw 32 is secured between frame members 20 and 22 and extends through apertures in these frame members to an internally threaded boss 34 on wall 27, thereby securing the printing apparatus to said wall 27 in predetermined alignment.

A plurality of seven printing heads identified generally as 41, 42, 43, 44, 45, 46, and 47 (FIG. 1) is provided. The printing heads are linearly aligned for printing

along one dimension of a rectangular array of columns and rows. The printing head arrangement illustrated is particularly adapted for printing one column of a rectangular array of seven rows and a plurality of columns determined by the number of digits in the coding system. A printing solution is supplied to the printing heads from a reservoir means which includes an enclosed body 50 having a wicking material 52 extending into the body and packed within the body in order to form a saturated material from which each of the printing heads may be wetted. As indicated in greater detail hereinafter, each head transports a porous material such as felt or foam which contacts the wick 52. The wick extends from the reservoir body 50 through a tubing 54 into a second reservoir 56 containing a printing solution. The printing solution comprises, for example, a liminescent material such as Tinopol SFG (Geigy Chemical Corporation) dissolved in any suitable volatile organic solvent for the plastic material from which the credit card is fabricated, with solute concentration ranging up to about 1 percent. A preferred preparation employs methyl ethyl ketone or tetrahydrofuran as the solvent with solute concentrations of about 0.2 percent. The credit card can be formed of PVC or other suitable plastic material. The reservoir body 50 includes a cylindrically shaped end segment 58 which along with the oppositely positioned tube 54 function as journals about which the reservoir 50 can be rotated. The segments or shaft projections 58 and 54 are seated in cylindrical bearings which form integral portions of demountable brackets 62 and 64 respectively (FIG. 3). These brackets are screw mounted to the frame members 20 and 22 and are therefore readily demountable. When the reservoir body 50 is rotated into a home position as best illustrated in FIG. 5, a porous body 76 (shown dotted) in the print head insert 66 which is mounted on each of the printing heads 41-47 extends through a wall 68 of the reservoir 50 and contacts the wicking material 52. The porous body 76 comprises a porous material such as felt or foam which absorbs printing solution from the wicking material.

During a printing portion of an operation cycle, the reservoir body 50 is automatically rotated from the home position shown in FIG. 5 in order to provide clearance for the printing heads which are then driven from the home position toward a card 78. A mechanism embodying the cooperative operation of the reservoir and printing heads is described in U.S. Pat. application Ser. No. 1,17,919, entitled "Printing System" by William W. Coville filed February 24, 1971 and which is assigned to the assignee of this invention. The reservoir body 50 is maintained in a home position by virtue of force applied to this body by a bias coil spring 80 (FIG. 2). The spring 80 is coupled between a stationary post 82 mounted on a frame member and rotary drive link member 84. The reservoir body 50 is rotated in a counterclockwise direction from the home position to a print position thereby disengaging the body from the printheads and providing clearance for clockwise rotation of the printing heads 41-47. The print position of the body 50 is represented in FIGS. 2 and 6 by the broken lines which are identified generally by reference numeral 86. A cam 88 (FIG. 2) is mounted on a drive shaft 104 and drives the link 84 about a pivot pin 85 toward the right in an upwardly direction as viewed in FIG. 2 against the resistive force of the spring 80. The drive force is applied from cam 88 via a cam follower

90 which is rotably mounted on the link 84. The link 84 is pivotally coupled by a pin 92 to a second drive link 94. Drive link 94 is coupled by a pin 96 to an arm segment 97 of the reservoir 50. Rotary motion of the arm segment 97 causes counterclockwise rotation of the reservoir body 50. The driveshaft 104 upon which the cam 88 is mounted is driven by a pulley 102. As best illustrated in FIG. 7, a drive pin 106 extends through the shaft 104 near one end thereof and engages a slot 98 in a primary drive shaft 100. The primary drive shaft 100 extends through the wall 27 in the apparatus and is driven by the pulley 102 which receives power from a drive belt and motor, not illustrated.

A printing head assembly is illustrated in FIG. 5. Although the head assembly for head 47 will be described, it is understood that each of the printing heads 41-46 have similar assemblies. The printing head assembly includes a pivotally mounted bifurcated arm member 110 having a recessed aperture 112 for receiving a print head insert 66. As indicated previously, the insert supports a wettable medium 76 which extends into the body 50 in the home position. The arm 110 is pivotally mounted about a pin 114 which extends between frame members 20 and 22 and is secured thereto by locknuts (FIG. 1) located on threaded extremities of the pin. The arm member 110 further includes a recess for seating a spring drive 116. The helical coil spring 116 is positioned about a stud 118 of a print head drive member 120. The print head drive member 120 is also pivotally mounted about the pin 114. Rotation of drive member 120 in a clockwise direction causes application of a force through the spring 116 to the print head member 110. This force causes clockwise rotation of the member 110 into contact with the card 78. The print head drive member 120 is rotated by a drive link 122, described hereinafter, which is pivotally coupled by a pin 124 to the member 120. In operation, a pin 130 of a U-shaped bail bracket 126 which is also pivoted about the pin 114 is rotated in a clockwise direction thereby enabling clockwise rotation of the printing head. This position of the bracket is represented by dash lines in FIG. 5. The printing head assembly will then rotate in a clockwise direction when the link 122 moves in a direction downward and to the left as viewed in FIG. 5. At the termination of the printing step, the bail bracket 126 will then rotate in a counterclockwise direction. During this motion of the bail, the bail pin 130 which extends across the bail and is secured at opposite arm segments of the bail will engage a lower surface or a flange segment 132 of the print head drive member 120. This movement forces the drive member to rotate in a counterclockwise direction and a jaw segment 134 of the drive member engages a sloped surface 136 of a bifurcated portion of print head member 110 and forces it to rotate in a counterclockwise direction. The drive head will be rotated to a home position at which point its movement will be restricted by a pin stop 138.

A print head drive and print head select means constructed in accordance with features of the invention is illustrated in detail in FIG. 6. While FIG. 6 illustrates a select and drive means for print head 47, it is understood that similar printing means are provided for each of the other print heads 41-46. An elongated lever arm 140 is pivotally mounted by a pin 142 which extends between frame members 20 and 22. The drive link 122 is pivotally coupled to the lever arm 140 by a pin 141

at a point along its length and motion of the lever 140 about the pivot 142 will cause substantially linear motion of the link 122 for relatively short displacements of the lever. The lever arm 140 is forced to rotate in a clockwise direction about the pivot by a spring 144 which is coupled between the lever and stationary post 82. As indicated hereinbefore this clockwise rotation will cause substantially linear motion of the link 122 and force the printing head 47 into a printing position or shown in dot-dash lines.

A means for selectively inhibiting the motion of the lever arm 140 and thereby inhibiting printing by the head 47 comprises a solenoid 146 having an armature 148 thereof which is coupled to one of a plurality of slots 150 formed on the lever 140. One such solenoid for restricting each head is provided. When the solenoid 146 is energized in accordance with a predetermined printing code, the armature 148 will be restrained and will exert a force countering the force of the spring 144 thereby restricting clockwise motion of the lever. On the other hand, when the printing head 47 is selected for printing in accordance with a predetermined code, the energization of the solenoid will be decreased by an amount sufficient to permit the force exerted by the spring 144 to overcome the restrictive force established by the solenoid and permit rotation of the lever arm 140 about the pivot point 142. Most conveniently this is accomplished by simply interrupting power to the selected solenoid. After selection and printing, the lever arm 140 along with the armature 148 is returned to a home position by motion of the bail bracket 126 which transmits a restoring force through a pin 130, the head drive member 120, and the link 122.

The bail assembly is illustrated in greater detail in FIG. 4. The bail assembly includes the U-shaped bracket 126 which was referred to hereinbefore and which is pivoted about the pin 114. This U-shaped bracket is rotated by a force transmitted to it from a cam 160 which is mounted on the drive shaft 104. The cam couples motive force via a cam follower 162 to a bail drive link member 164. The drive link member 164 is coupled by a pin 166 to a bail link member 168, the latter member being pivotally coupled to the bail bracket through the pin 130. The bail bracket 126 is biased in a clockwise direction by a helical spring 170 which is coupled between the link 164 and a stationary post 82. When the drive link 164 is positioned in its lowermost position as shown by the dashed lines in FIG. 4, then the bail bracket 126 has been rotated to its furthestmost clockwise location. At this location, the pin 130 no longer restricts head motion and the printing heads can then be rotated when selected. Those selected for operation by an associated solenoid will then be rotated into printing position. At the end of the print interval during an operational cycle, the rotating cam 160 drives the bail armature 126 in a counterclockwise direction against the resistive force of the spring 170 and the pin 130 forces the printing heads to their home position.

A demountable support for the reservoir 56 is illustrated in FIG. 7. The reservoir 56 is positioned on a right-angle support body 180. The body is mounted to the frame member 22 by screws 181 which engage threaded apertures in the frame member. A right-angle bracket 182 is provided for establishing a restraining force on the reservoir 56 for securing the reservoir to

the body 180. The bracket 182 is forced to the right as viewed in FIG. 7 by a spring biasing means 184 which is positioned on a pin 185. A soft resilient material such as sponge or rubber 186 provides an interface between the bracket 182 and the reservoir 56. This mounting arrangement and the mounting arrangement for the reservoir 50 provides for demounting of the entire reservoir system for cleaning and replenishment.

The printing apparatus can be readily removed from the wall 27 by rotation of a knurled screw handle 190 and by withdrawing the assembly from the guides 28 and 29. Connections for coupling energizing voltages to the solenoids are provided by a connector 192 which is mounted to the wall 27. A male connector which is mounted to the frame of the printing apparatus engages the connector 192 when the printing apparatus is mounted and secured to the wall 27.

The events during an operating cycle occur as follows. During a null portion of the cycle, a card 78 is stepped an incremental distance to the head printing station. At this point of time in the cycle, the printing heads and reservoir body 50 are located in their home position and the wettable transfer mediums 76 for each head are thereby wetted. The bail assembly pin 130 (FIG. 6) is located at its most counterclockwise position as illustrated. The bail drive cam 160 (FIG. 4) then causes clockwise rotation of the bail bracket 126 and pin 130 thereby enabling the selected printing heads to rotate and print. Additionally, the reservoir drive cam 88 rotates the reservoir 50 in a counterclockwise direction providing freedom of movement for the drive heads. Those electromagnets associated with heads which are to print become de-energized. The printing head drive member 120 will rotate and follow the bail pin 130 forcing the print head member 110 to form a mark on a card 78. The bail bracket 126 and pin 130 is then driven in a counterclockwise direction thereby forcing the printing heads to return to their home position. At this time the reservoir 50 is driven in a clockwise direction to its home position and the operating cycle is completed.

Thus, there has been described a relatively reliable and simplified arrangement for selectively printing a plurality of digits at one or more locations in a regular array of columns and rows. A relatively small number of operating components are required concurrently reducing the cost of the apparatus.

While I have described and illustrated a particular embodiment of my invention, it will be understood that various modifications may be made therein without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In a printing apparatus having a plurality of pivotally mounted printing heads positioned in alignment at a printing station for printing on a record medium which is advanced to the station, and means for transferring printing material to said heads when said heads are in a home position: the improvement for selecting and rotating selected ones of said printing heads into contact with a record medium for printing thereon comprising

a plurality of elongated lever arms each supported at a stationary pivot and each associated with a printing head;

means for coupling each of said lever arms to an associated head, said coupling means including a me-

chanical link pivotally mounted to said lever arm and to said head;
 means including a bias spring for applying a resilient force to each of said lever arms for causing said associated heads to rotate from a rest position to a printing position;
 means for selectively inhibiting the rotation of each of said lever arms and including a solenoid having an armature thereof coupled to an associated lever arm;
 said means for applying a resilient force to each of said lever arms including a bias spring;
 said print head including a pivotally mounted print head member and a pivotally mounted drive member and having a seat for receiving a resilient drive body;
 said head member having a bifurcated segment, said bifurcated segment defining a surface which when a force is applied thereto causes rotation of said head member; and
 said drive member including a jaw segment for engaging said surface and causing said drive member to rotate, said drive means further including means for positioning a resilient body for engagement with said seat of said print head member.

2. The apparatus of claim 1 including means for automatically rotating said printing head to a rest position from a printing position.

3. The apparatus of claim 2 wherein said means for rotating said printing heads comprises a rotably mounted body having a cross member for engaging each of said heads and for forcing said heads to a home position, and means for causing periodic rotation of said body.

4. The apparatus of claim 3 wherein said cross member engages said head drive member for returning said print head to a home position.

5. A printing apparatus comprising:
 a plurality of pivotally mounted printing heads positioned in linear alignment at a printing station for

printing on a record medium which is advanced to the station;
 each of said printing heads comprising a pivotally mounted print member and a pivotally mounted drive member, said head member including a seat for receiving a resilient drive body, said head member further including a bifurcated segment having a surface which when a force is applied to said surface causes rotation of said head member, said drive member including a jaw segment for engaging a surface of the bifurcated segment, said drive member including means for positioning a resilient body in engagement with said seat, said head member including a wettable body positioned thereon for depositing a printing material on a record medium;
 means for transferring printing material to said wettable body when said wettable is in its home position;
 a plurality of elongated lever arms each supported at a stationary pivot point and each associated with a printing head;
 means for coupling each of said lever arms to its associated head;
 means for applying a resilient force to each of said lever arms for causing said associated heads to rotate from a rest position to a printing position;
 a plurality of solenoids each having an armature thereof associated with and coupled to an associated one of said lever arms for selectively inhibiting the rotation of said lever arms;
 a rotatably mounted bracket having a cross member for engaging each of said heads and forcing said head to a home position;
 a drive shaft having a drive cam positioned thereon; and
 means for coupling said cam to said rotatable bracket for engaging each of said heads and forcing said heads to a home position.

* * * * *

45

50

55

60

65

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3752068 Dated August 14, 1973

Inventor(s) Herbert Tramposch and Daniel M. Kabak

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3 Line 25, change "materila" to --material--.

Column 6 Line 36, change "barcket" to --bracket--.

Claim 5, Column 8 Line 18, after wettable, insert --body--.

Signed and sealed this 15th day of April 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks